

# TRANSPORT FOR NSW (TfNSW)

## QA SPECIFICATION R178

### VEGETATION

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#### REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 1/Rev 1			GM, CMS	Jan 91
Ed 1/Rev 2	R80.2.8 Table R80.1 Annexure R80/1	Reference to RTA Supply Spec amended. Changes to application rates to materials for straw mulching. Additional notes added.	GM, CMS (Rod Neal) GM, CMS (H Larrea) GM, CMS (H Larrea)	16.12.91
Ed 2/Rev 0	3.6 Table R80.1	Clause numbers and list have been changed to suit the new format. Signs to be supplied by the Contractor. Table has been redesigned.	GM, CEC (J Woodward)	28.07.95
Ed 2/Rev 1	9	Specification Number changed from R80 to R162. Converted to MS Word 6.0c. References to RTA Specifications changed. Pay items R162P10, P15 and P17 redefined for payment for bitumen emulsion.	GM, RNIC; (J Woodward)	19.02.97
Ed 3/Rev 0	1.2 1.3 1.4	Specification Number changed from R162 to R178. Guide notes added. References to brand names deleted. Retention of soil erosion measures specified. Wording changed to clarify applicable issue of referenced documents. AS4419 and Peskem added. New clause defining terms.	GM, RNIC	14.06.02

<b>Ed/Rev Number</b>	<b>Clause Number</b>	<b>Description of Revision</b>	<b>Authorised By</b>	<b>Date</b>
Ed 3/Rev 0 (cont'd)	2	Sub-clauses renumbered and retitled. New and reworded requirements for materials including requirements for disposal of Contaminated Topsoil. Requirements for organic fibre mat and bitumen emulsion added. HOLD POINT for imported topsoil and WITNESS POINT for fertiliser added.		
	3	Retitled and reworded to include vegetation on slopes of any grade. New provisions for treating noxious weeds, topsoil on stepped batters, seed pretreatment and hydromulching. WITNESS POINT for sowing added.		
	4	Previously Clause 5. Minor rewording.		
	5	Previously Clause 6. Topsoiling before turfing specified.		
	6	Previously Clause 7. Minor rewording.		
	7	Previously Clause 7.2. Areas disturbed redefined.		
	8	Retitled and maintenance items other than watering included.		
	9	Pay items amended, new items included.		
	Annexure R178/1	Reworded.		
	Annexure R178/2	New Annexure.		
Ed 3/Rev 1	Various	Clauses and annexures in new format, minor editorial changes.	GM, RNIC	24.07.03
	1.2	New clause, references transferred to Annexure R178/M.		
	1.3	Residual Bitumen defined. Wood deleted from straw mulch.		
	1.4, 3.1, 3.2, 3.5.1, Annex R178/C	Steep slope changed from > 3:1 to > 5:1.		
	2.3	Nominate suppliers in PQP.		
	2.6	Use shredded paper.		
	2.7	Verify non-potable water.		
	2.10, 3.4	Grasses deleted.		
	2.11	Mat mass reduced.		
	2.11, 2.13	6 mm pins accepted.		
	3.3.2 Table R178.1	Binder added. Rates changed.		

<b>Ed/Rev Number</b>	<b>Clause Number</b>	<b>Description of Revision</b>	<b>Authorised By</b>	<b>Date</b>
Ed 3/Rev 1 (cont'd)	3.5.1 3.6 4.1 4.2 4.2, 4.3.1, 4.3.2 8 Annexure R178/B	Hydroseeding required for rock faced batters. Contractor to erect signs. Tyning applies to open drain areas. Watering is not mandatory. Mechanical sowing deleted. Application redefined. Water when directed. Mechanical sowing (P12) deleted. Pay Item numbers P13 + changed. Pay Items P16, P17 redefined.		
Ed 3/Rev 2		Fonts changed.	GM, RNIC	07.08.03
Ed 4/Rev 0	Various  Foreword 1.2.3, 2.1.1, /B, /C2, /M 1.2.4 1.3, 2.10, 3.3.2, 3.4 3.3 7	Text revised to direct imperative style. "Superintendent" replaced by "Principal". "shall" replaced by "must". Reformatting and minor editing. New clause after the Table of Contents. Changes to referenced documents. Minor editorial change. All references to and requirements for insecticide deleted. Hold Point shown. Payment detail transferred to R178/B.	GM, RNIC	24.08.05
Ed 5/Rev 0	Global  Guide Notes  Example of Completed Annexure A 1.3 2.1.2	Clauses re-worded to remove ambiguity and to clarify intent. "Discussion Point" deleted. Requirement to consider soil testing deleted, as this is now mandatory. Phone contact number of Landscape Design Policy and Standards Manager updated. Notes on how to complete Annex A added. Native seed species changed. "Contaminated topsoil" changed to "Weed contaminated topsoil". "Initial watering" and "slope ratio" defined. New clause specifically on weed contaminated topsoil added.	GM, IC	30.07.07

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date	
Ed 5/Rev 0 (cont'd)	2.4	“Pelletised poultry manure” inserted as an acceptable organic type fertiliser.			
	2.6	“Finely chopped sugarcane mulch” added as acceptable fibre mulch.			
	2.8	“Guar gum” inserted as an acceptable biodegradable binder.			
	2.9	Clause on “wetting agent” replaced by clause on “vegetable dye”.			
	2.10, 4.1.1, Annex B	“Organic fibre mat” changed to “organic fibre mesh”.			
	2.12	Additional requirements for turf added.			
	3	Heading changed to distinguish from work associated with open drains.			
	3.1	Original clause sub-divided into Clause 3.1.1 “Herbicide Spraying”, Clause 3.1.2 “Slopes”, and Clause 3.1.3 “Paved Areas”.			
		Requirement for compliance with Pesticides Act 1999 and the public notification requirements in G34, G35 or G36 added.			
		Requirement for red dye in herbicide inserted.			
		Lining of batters with organic fibre mesh added.			
		“Windy weather” defined.			
		3.3.1			Time limitations imposed on use of pretreated seed.
		3.3.2			Table R178.1 amended.
		3.4.3, 3.4.4			Minimum thickness of hydromulch and straw mulch layers specified.
		3.4.5			Maximum temperature restriction added.
4		Sub-clauses rearranged, in order of construction sequence.			
5	Original clause for turfing sub-divided into Clause 5.1 “Areas other than open drains” and Clause 5.2 “Open drain areas” due to the differing requirements for each case.				
8	Additional requirements for maintenance of turfed areas added.				



<b>Ed/Rev Number</b>	<b>Clause Number</b>	<b>Description of Revision</b>	<b>Authorised By</b>	<b>Date</b>
Ed 5/Rev 4 (cont'd)	3.1.1	Permissible wind speed for herbicide spraying changed.		
	5	Clause clarified to limit scope to turfing for revegetation only (excluding turfing for lawn areas); clause title changed.  Watering requirements changed.		
	Annex B	Pay Item P18 and sub-items P18.1 and P18.2 description changed.		
	Annex M	References updated.		
Ed 5/Rev 5	Global	References to “Roads and Maritime Services” or “RMS” changed to “Transport for NSW” or “TfNSW” respectively.	DCS	22.06.20

## GUIDE NOTES

(Not Part of Contract Document)

Vegetation of areas of disturbed soil is carried out for both environmental and aesthetic reasons. The urgent requirement is to stabilise the soil to minimise soil erosion and this is the fundamental requirement of the vegetation work covered by Specification TfNSW R178.

Other QA specifications cover related matters including soil erosion and sediment control measures, clearing and grubbing, earthworks (which specifies requirements for excavation and stockpiling of topsoil), seed collection (under preparation) and landscape planting.

The provisions in TfNSW R178 are suitable for most contracts but the wording should be reviewed for each project to ensure appropriateness. Project specific changes should be made as necessary.

The following notes are intended to assist in assembling the contract documents for a project and in making project specific changes to TfNSW R178:

- This Specification requires supplementary documents to form the complete documentation for a Contract. These include tendering information, Conditions of Contract and a Schedule of Rates. Care must be taken to ensure that the Schedule of Rates contains the same species and weights/numbers of seed as Annexure R178/A.
- Vegetation work requires the undertaking of potentially hazardous tasks including use of toxic chemicals. It is essential that TfNSW G22 “Occupational Health and Safety” and TfNSW G36 “Environmental Protection” be included in the contract documents. Attention should be drawn to the requirement in the latter documents to comply with the “TfNSW Pesticide Use Notification Plan”.
- Clause 2.3 requires that all seed used be of the species and varieties listed in Annexure R178/A.

In many projects the time constraints do not allow the Contractor to gather native seed and therefore, when locally collected native seed is required, it is usually supplied by the TfNSW and the seed to be so supplied is to be identified in Annexure R178/A. To allow sufficient time to collect the seed it is necessary to arrange a separate contract for seed collection at least two years in advance of the planned date of commencement of the roadworks.

Where the contract duration will allow collection by the Contractor, Annexure R178/A should be completed accordingly and the project specific amendments to Clause 2.3 should be made requiring compliance with the QA specification for seed collection.

- Clause 2.7 permits the use of water which is not taken from a potable supply. Appropriate testing should be undertaken and advice should be obtained from a qualified Landscape Officer when doubt exists as to the suitability of a proposed source.
- Clause 2.8 provides for two types of binder. Alternatives to anionic bitumen emulsions which show environmental and WHS benefits should be encouraged.
- Clause 3 - Project Managers must ensure that the design slopes of batters are suitable for the vegetation strategy proposed. Particular attention should be given to steep slopes where the subsoil or rock and the groundwater conditions could cause instability of the topsoil and vegetation.
- Pre-treatment of seeds to assist germination is beneficial for several native species. The only treatment specified in detail in Clause 3.3.1 is soaking the seeds enclosed in a bag in hot water. Where other non-proprietary methods are specified in Annexure R178/A project specific additions should be made to Clause 3.3.1

## **Annexure R178/A**

Annexure R178/A must be completed by the Project Manager to show the species required and the quantities and any pre-treatment required for each species.

Reference may be made to TfNSW document “Landscape Guidelines (Consultation Draft)”. Assistance in selection of species and estimating the quantity needed may be obtained from the Landscape Advisor (Phone 02 8588 5776).

If different mixes are required for different areas, then they should be labelled as “Type 1 mix”, “Type 2 mix”, etc.

Note the restriction on areas where Eucalyptus seeds can be sown, as highlighted by the asterix (\*).

Indicate any pre-treatment on the seeds that may be necessary.

An example of completed Annexure R178/A follows.

## **Annexure R178/D**

Annexure R178/D gives a quick and easy reference to the approximate number of loads required to achieve the specified application rate stated in Table R178.1 and the required finished thickness of the sprayed layer for typical mixing tank capacities.



## EXAMPLE OF COMPLETED ANNEXURE R178/A

Mix Type: 1 for Area: Roadside

Species	Application Rate (kg/ha)	Pre-treatment <sup>(1)</sup> Required
<b>Grass Seed</b>		
<i>Japanese Millet</i> (Summer: September to March)	35.0	
<b>or</b>	or	
<i>Rye Corn</i> (Winter: April to August)	35.0	
<i>Eclipse Rye</i> All year	25.0	
<i>Red Clover</i> All year	5.0	
<b>Grass Seed Sub-total</b>	<b>65.0</b>	
<b>Native Seed</b>		
<i>Austrodanthonia 'Hume'</i> pelletised seed	2.0	
<i>Micolaena stipoides 'Griffin'</i> pelletised seed	2.0	
<i>Themeda 'Tangara'</i> pelletised seed	1.0	
Native tree, shrub and groundcover mix, e.g.	5.0	
<i>Acacia</i> sp		Yes
<i>Banksia</i> sp		
<i>Casuarina</i> sp		
<i>Hardenbergia</i> sp		Yes
<i>Eucalyptus</i> sp		
<b>Native Seed Sub-total</b>	<b>10.0</b>	
<b>Organic Fertiliser:</b> Pelletised poultry manure	250	

**Notes:**

- (1) Pre-treatment consists of immersing the seeds contained in a bag in hot water at 90°C for 60 minutes.
- (2) All native seed will be supplied by the Principal. Only local native species will be used.
- (3) *Eucalyptus* seed must not be sown:
  - on embankments of sediment control basins;
  - within 10 metres of the edge of pavement where no safety barrier is to be provided, or within 4 metres of the edge of pavement where a safety barrier is to be erected;
  - within 10 metres of powerlines.
- (4) *Triticale* species must not be used in revegetation mixes in the Tablelands, Central Slopes and Western Plains regions, in order to prevent the spread of “wheat rust” in wheat growing areas.
- (5) *White, Strawberry* and *Subterranean Clovers* (used as cover crops) must not be used in conjunction with native seeding, since their aggressive spreading growth may prevent germination of native seeds.
- (6) All future mowing will be limited to a 2.0 metre wide strip adjacent to both sides of the carriageway. The remaining road reserve areas must be left unmown to permit natural regeneration of native seed.





# VEGETATION

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VERSION FOR: DATE:
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## FOREWORD

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### REVISIONS TO PREVIOUS VERSION

This document has been revised from Specification TfNSW R178 Edition 5 Revision 4.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

### PROJECT SPECIFIC CHANGES

Any project specific changes are indicated in the following manner:

- (a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. ***Additional Text***.
- (b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

## TfNSW QA SPECIFICATION R178

### VEGETATION

## 1 GENERAL

### 1.1 SCOPE

This Specification sets out the requirements for the vegetation of cut and fill batters, median areas, open drains and other areas within the site.

Vegetation includes initial surface preparation, topsoiling, fertilising, sowing of seed and watering.

### 1.2 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

#### 1.2.1 Details of Work

Details of work are shown in Annexure R178/A.

#### 1.2.2 Measurement and Payment

The method of measurement and payment must comply with Annexure R178/B.

#### 1.2.3 Schedules of **HOLD POINTS**, **WITNESS POINTS** and **Identified Records**

The schedules in Annexure R178/C list the **HOLD POINTS** and **WITNESS POINTS** that must be observed. Refer to Specification TfNSW Q for the definitions of **HOLD POINTS** and **WITNESS POINTS**.

The records listed in Annexure R178/C are **Identified Records** for the purposes of TfNSW Q Annexure Q/E.

#### 1.2.4 Referenced Documents

Unless specified otherwise or is specifically supplied by the Principal, the applicable issue of a referenced document, is the issue current at the date one week before the closing date for tenders or, where no issue is current at that date, the most recent issue.

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 1289). For convenience, the full titles are given in Annexure R178/M.

## 1.3 DEFINITIONS

The terms “you” and “your” mean “the Contractor” and “the Contractor’s” respectively.

The following definitions apply to this Specification:

<b>Initial watering</b>	Initial watering is the first watering of turf immediately after installation.
<b>Hydromulching</b>	Application of seed, fertiliser and cellulose fibre mulch by spraying a mixture of these ingredients with water and a binder.
<b>Hydroseeding</b>	The sowing of seed by spraying a seed/water mixture. The mixture normally includes fertiliser and a wetting agent.
<b>Residual bitumen</b>	Bitumen that remains after emulsion has broken and water has evaporated.
<b>Straw mulching</b>	Placing a straw mulch using a blower. A binder is incorporated into the air stream or sprayed over the mulch as a separate operation.
<b>Weed contaminated topsoil</b>	<p>Weed contaminated topsoil is that material which contains or is likely to contain a significant proportion of potentially invasive weed species which are known to spread by residual seed or propagules contained in the soil.</p> <p>Weed species include, but are not necessarily limited to, those listed by the relevant local government authority as noxious categories W1, W2, W3 or W4 under the Noxious Weeds Act 1993. Also included under this definition are agricultural and horticultural weed species and in particular invasive grasses such as <i>Chloris gayana</i> (Rhodes grass), <i>Phalaris</i> spp., <i>Eragrostis curvula</i> (African lovegrass), <i>Andropogon virginicus</i> (Whisky grass) and <i>Nassella trichotoma</i> (Serrated tussock).</p> <p>Where necessary, advice must be sought from a qualified Landscape Officer in order to determine whether the type and/or proportion of weed cover is significant for the purposes of this definition.</p>

All slopes stated in this specification are in the ratio of horizontal to vertical distance.

## 1.4 TIMING OF WORK

Complete work progressively within the following time frames:

- (a) **Vegetation of Areas with Slopes 5 to 1 or Flatter:** where earthworks requiring vegetation have been completed over an area exceeding one hectare, carry out vegetation within 14 days.
- (b) **Vegetation of Areas with Slopes steeper than 5 to 1:** where earthworks requiring vegetation have been completed over an area exceeding one hectare, carry out vegetation within 7 days.
- (c) **Open Drains:** complete vegetation within 7 days of excavation.

Soil erosion and sediment control measures for any area must remain in place and be maintained at least until the new vegetation provides sufficient protection to keep erosion to a similar level to that of typical local natural bushland.



## **2 MATERIALS FOR VEGETATION**

### **2.1 TOPSOIL**

#### **2.1.1 Topsoil from Site**

Stockpile on site material identified by the Principal for stripping and re-use as topsoil.

Carry out tests on the stockpiled topsoil using a NATA accredited testing laboratory to ascertain its suitability for use in revegetation works. Where the stockpiled topsoil is sourced from different locations within the work site, soil tests will be required for topsoil sourced from each location.

The soil test certificate must contain the date of testing and details of the types of test undertaken and their results, including cation analysis, pH values, salt content, particle analysis and any recommendations on the use of the topsoil.

If the soil test certificate indicates any stockpiled topsoil to be unsuitable for use in revegetation works, the Principal may direct you to carry out the measures recommended in the soil test certificate to improve the stockpiled topsoil. Any improvement measures directed by the Principal will be dealt with as a variation.

Use only stockpiled topsoil suitable for use in revegetation works as topsoil unless directed otherwise by the Principal.

Before use for vegetation, screen or sort the topsoil to remove stumps, roots, clay lumps or stones greater than 50 mm in size.

#### **2.1.2 Weed Contaminated Topsoil**

Do not use weed contaminated topsoil in the Works.

Dispose of weed contaminated topsoil located in stockpiles in accordance with the requirements for spoiling in Specification TfNSW R44.

Bury the weed contaminated topsoil away from any pavement, structure, water course or drainage path and with a cover of inert fill of a minimum 500 mm compacted thickness. The inert fill must:

- (a) be from the specified earthworks, or when authorised by the Principal, from borrow;
- (b) be free of any material with a particle size exceeding 75 mm;
- (b) have a Plasticity Index between 10 and 20 when tested in accordance with Test Method TfNSW T109; and
- (c) be placed and compacted in accordance with the requirements for embankments in Specification TfNSW R44.

Spread uncontaminated topsoil over the burial area and revegetate within 7 days.

#### **2.1.3 Imported General Purpose Topsoil**

Where imported general purpose topsoil is required, it must be a blend of sand, natural soil and organic materials and be suitable for the culture of all plant material and, in particular, exotic and native grasses. It must:

- (a) be of a friable porous nature;

- (b) contain no refuse or materials toxic to plant growth;
- (c) contain no stumps, roots, clay lumps or stones larger than 50 mm in size;
- (d) have an organic content of at least 5% by mass as determined by the method specified in AS 1289 D1.1 Part D;
- (e) have a pH in the range of 5 to 6.5 when tested in accordance with Test Method TfNSW T123;
- (f) have a soluble salt content not exceeding 0.06% by mass;
- (g) be suitable for phosphorus sensitive plants; and
- (h) be free of weed and weed refuse material.

### **HOLD POINT**

Process Held:	Delivery of imported general purpose topsoil.
Submission Details:	At least 7 days prior to delivery, a statement signed by you verifying that the topsoil complies with specified requirements. The statement must quote test results and must certify that the topsoil is not contaminated topsoil.
Release of Hold Point:	The Principal will consider the submitted documents and may inspect the test records prior to authorising the release of the Hold Point.

## **2.2 HERBICIDE**

Herbicides used must be currently registered for the treatment of weeds by the Australian Pesticides and Veterinary Medicines Authority (APVMA). Use herbicides in accordance with the manufacturer's directions supplied with the product. Herbicides must be glyphosate based unless otherwise required by the relevant local government authority.

Information on registered herbicides may be obtained from the APVMA Internet site [www.apvma.gov.au](http://www.apvma.gov.au).

## **2.3 SEED**

All seed used must be of the species and varieties listed in Annexure R178/A.

Supply all seeds required, unless stated otherwise in Annexure R178/A that locally collected native seed will be supplied by the Principal.

Note that there may be a lead time of up to two years for procurement of some native seed species.

Include in the PROJECT QUALITY PLAN the name/s of the proposed seed supplier/s. This information may be advised to the Principal as an addendum if it is not available when the PROJECT QUALITY PLAN is submitted. This addendum must be submitted prior to any seeding application.

The native seed must be delivered to the Site in separate lots for each species and variety, clearly labelled to show species, variety and weight. Each seed species must be accompanied with a species identification certificate. Grass and clover seed must be pre-packed commercially with an accompanying certificate of germination as well as a certificate of authenticity. Where site conditions are not suitable for the pre-treatment and mixing of seed, this may be done off site and an

accompanying certificate showing the species, variety, weight and place of treatment submitted to the Principal prior to seeding application.

Advise the Principal of the unavailability of any of the specified seed species at least six weeks in advance of sowing.

Locally collected native seed supplied by the Principal will be delivered to the site at no cost to the Contractor. Where this is the case, notify the Principal, in writing, at least five days prior to commencing vegetation of an area, so that the Principal can arrange supply of the locally collected native seed. This notification must indicate the location and area to be treated and the quantity of native seed required.

## **2.4 FERTILISER**

Fertiliser used must be of an organic type, such as pelletised poultry manure, having an N:P:K analysis (stated in elemental form) within the following range:-

- (a) N: 5.0% to 9.0%
- (b) P: 1.0% to 4.0%
- (c) K: 2.0% to 4.0%

Fertiliser must be delivered to the Site in unopened standard bags or containers bearing the manufacturer's details and analysis and quantity of its constituents.

### **WITNESS POINT**

Process Witnessed: Application of fertiliser

Submission Details: Notify Principal, not less than 2 working days prior to the intended time of applying fertiliser, that the unopened bags or containers of fertiliser are available for inspection on Site.

## **2.5 STRAW**

Straw to be used in mulching operations must be derived from cereal crops comprising wheat, oats or rice. Meadow hay must not be used. Straw must be certified as free of weeds.

## **2.6 CELLULOSE FIBRE MULCH**

Cellulose fibre mulch must be produced from finely chopped sugarcane mulch, shredded recycled paper or wood fibre from plantation timber such as *Pinus radiata*. Unless shown on the Drawings or specified otherwise, the mulch must be dyed green using a non-toxic biodegradable dye.

Preference is to be given to locally produced products. Imported products are to be declared for approval, nominating the source and country of origin.

## **2.7 WATER**

Water used must be potable or obtained from a source which contains no toxins or pollutants or any substance which would adversely affect the growth of any of the plants to be sown.

When the use of non-potable water is proposed, test the source and, prior to sowing, provide the Principal with verification that the water is free of toxins or pollutants or substances which would adversely affect the growth of plants to be sown.

## **2.8 BINDER**

The binder used in vegetation work must be a slow setting anionic bitumen emulsion complying with Specification TfNSW 3254 or a non-toxic biodegradable polymer binder manufactured for the intended use, such as “Guar gum”.

## **2.9 VEGETABLE DYE**

Dye used in herbicide spraying, hydroseeding and hydromulching applications must be a biodegradable, red or green coloured vegetable dye, as applicable.

## **2.10 ORGANIC FIBRE MESH AND FIXING PINS**

Unless specified otherwise, organic fibre mesh used must be Soil Saver Jute Mesh.

Fixing pins must be “U” shaped made from 4 mm to 6 mm diameter plain steel wire with 150 mm long legs 50 mm apart.

## **2.11 BITUMEN EMULSION**

Bitumen emulsion used for the protection of open drains must be a slow setting anionic bitumen emulsion complying with TfNSW 3254.

## **2.12 TURF AND FIXING PINS**

Turf must be *Zoysia* ‘Empire’ or equivalent, dense with vigorous grass growth and be well rooted to at least 25 mm thick and be free of weeds, soil pests and diseases. Kikuyu grass must not be used.

Turf must be verdant and fresh when delivered, with the earth base lightly moist and the turf grass close mown. The turf must be freshly cut in long lengths of uniform width not less than 300 mm, and in sound unbroken condition. Turf must be supplied in rolls and when unrolled must hold together and not crumble.

Fixing pins must be “U” shaped made from 4 mm to 6 mm diameter plain steel wire with 150 mm long legs 100 mm apart.

# **3 VEGETATION OF AREAS OTHER THAN OPEN DRAINS**

## **3.1 PREPARATION OF SURFACE**

### **3.1.1 Herbicide Spraying**

Herbicide use must comply with the Pesticides Act 1999.

Before commencement of any herbicide spraying, comply with the requirements of Specification TfNSW G36 on public notification of pesticide use.

Where weed infestation is present:

- (a) for those species listed by the relevant local government authority as noxious categories W1, W2, W3 or W4 under the Noxious Weeds Act 1993, take action as required by the Act and the local government authority; and
- (b) for all other species, spray with the specified herbicide.

The Principal may direct that the area to be treated for weed infestation be extended beyond the area to be vegetated.

A biodegradable red dye is to be included with the herbicide spray. The dye content used must be sufficient to ensure that the treated areas can be identified.

All work required to control noxious weeds of categories W1, W2, W3 and W4, except spraying with the specified herbicide, is treated as a variation to the Contract or, if so directed by the Principal, may be undertaken by others.

Areas sprayed with herbicide must remain undisturbed for a minimum period of two weeks or such longer period recommended by the herbicide manufacturer.

Do not spray herbicides in windy weather (wind speeds of 10 km/hr or greater) or within such distance of a watercourse which would permit the herbicide to enter the water.

### **3.1.2 Slopes**

Tyne slopes with gradients of 5 to 1 or flatter generally parallel to the surface contours to a depth of 150 mm to produce a loose surface and remove all stones larger than 100 mm in size, rubbish and other materials that may hinder germination before topsoiling.

Prepare batters steeper than 5 to 1 by three passes of a steel chain of minimum weight 25 kg/m to remove loose material, or by another method which produces a similar result, no earlier than 7 days before seeding. The treated surface must have all furrows aligned with the contours.

Where batters have been stepped, remove all loose stones larger than 50 mm and all rubbish.

Where shown on the Drawings or when directed by the Principal, line the batters with organic fibre mesh in accordance with Clause 4.1.1.

### **3.1.3 Paved Areas**

Where areas of old road formation are shown on the Drawings to be vegetated, rip up the areas through to the full thickness of the pavement. Likewise, for all temporary roads, stockpile areas and compound areas to be vegetated upon completion of the Works, rip to the greater of the full depth of the hardstand or pavement or a depth of 150 mm.

## **3.2 TOPSOILING**

Topsoil any areas to be vegetated which do not have a topsoil cover.

All uncontaminated topsoil stockpiled at the commencement of the earthworks must be used in the vegetation work. Imported topsoil may be used to make up for any shortfall in the quantity available from the Site.

Spray any undesirable grass/weed growth occurring on topsoil stockpiles with an herbicide before spreading the topsoil. More than one application of herbicide may be required. Apply the last application of herbicide not less than 2 weeks before spreading or such longer period recommended by the manufacturer.

Apply topsoil uniformly at a rate of 1 cubic metre per 20 square metres of surface to all areas which are to be topsoiled except stepped batters. Where batters have been stepped, loosely cover the steps to provide a wedge of topsoil on each step which is 30 mm to 70 mm deep against the vertical face at the back of the step.

On slopes which are 5 to 1 or flatter, cultivate the topsoiled area to a depth of 50 mm by a diamond harrow to provide a roughened surface with soil lumps not exceeding 50 mm dimension.

### **3.3 PREPARATION OF SEED**

Where site conditions are not suitable for the pre-treatment and mixing of native and grass seed, this work may be done off site in conditions conducive for this purpose.

#### **HOLD POINT**

Process Held:	Use of seed pre-treated off site.
Submission Details:	At least 3 working days prior to delivery, submit the accompanying certificate showing the species, variety, weight and place of pre-treatment.
Release of Hold Point:	The Principal will consider the submitted documents and may inspect the seed prior to authorising the release of the Hold Point.

#### **3.3.1 Pre-treatment to Assist Germination**

Pre treat those seeds shown in Annexure R178/A as requiring pre-treatment to assist germination.

Where hot water is the specified pre-treatment, place the seed in a calico bag together with camphor granules as an insect repellent at the rate of 50 g per 10 litres of water. Immerse the bag in hot water with temperature of around 90°C for a minimum period of 60 minutes or the period specified in Annexure R178/A, whichever is the greater, and then remove from the water, drain and allow to dry. When dry, mix the treated seed with the remaining seed and broadcast when conditions are suitable.

Seed that has been pre-treated must be used within five days of pre-treatment.

Where proprietary products are used to assist germination, use as recommended by the manufacturer.

#### **3.3.2 Preparation for Hydromulching, Hydroseeding and Straw Mulching**

Storage tanks, containers and equipment to be used in hydromulching, hydroseeding and straw mulching must be clean and free of contamination from previous operations.

The hydromulch, hydroseed and straw mulch must comprise the relevant materials listed in Table R178.1 applied at the rates set out in Table R178.1.

Table R178.1 – Application Rates for Materials

Material	Clause	Rate per Hectare
<b>(a) Hydromulching</b>		
(i) Water	2.5	35,000 litres
(ii) Organic fertiliser: pelletised poultry manure	2.4	250 kg
(iii) Seed	2.3	See Annexure R178/A
(iv) Cellulose fibre mulch: - Sugar cane mulch, mixed with 20% (by weight) of shredded paper; or - Wood fibre mulch	2.6	3,500 kg 2,500 kg
(v) Binder: granulated “Guar gum”	2.8	60 kg
(vi) Biodegradable green dye	2.9	As recommended
<b>(b) Hydroseeding</b>		
(i) Water	2.7	20,000 litres
(ii) Organic fertiliser: pelletised poultry manure	2.4	250 kg
(iii) Seed	2.3	See Annexure R178/A
(iv) Biodegradable green dye	2.9	As recommended
<b>(c) Strawmulching</b>		
(i) Straw	2.5	5,000 kg
(ii) Binder: - Undiluted residual bitumen emulsion or - Granulated “Guar gum”	2.8	2,500 litres 100 kg

Produce hydromulch/hydroseed slurry mixtures by adding the specified materials into the tank and agitate until a homogenous blend is obtained. Refer to Annexure R178/D for the approximate number of loads required per hectare of spraying, for typical tank capacities, in order to achieve the specified rates in Table R178.1 and the minimum thickness of the sprayed layer specified in Clause 3.4.

### 3.4 SOWING

#### 3.4.1 Sowing Methods

Unless shown otherwise on the Drawings, sow areas with slopes of 5 to 1 or flatter, using one of the following methods:

- (a) dry sowing, in accordance with Clause 3.4.2; or
- (b) for small areas only, by hand.

Unless shown otherwise on the Drawings, sow areas with slopes steeper than 5 to 1 in any direction, using one of the following methods:

- (i) hydroseeding and straw mulching; or
- (ii) hydromulching; or
- (iii) for rock face batters, hydroseeding; or
- (iv) for small areas only, by hand.

Stepped batters must be topsoiled as described in Clause 3.2 and hydroseeded or hydromulched.

### **WITNESS POINT**

Process Witnessed: Sowing

Submission Details: Notify the Principal, not less than 5 working days prior to the intended time of sowing, giving details of the area to be sown.

### **3.4.2 Dry Sowing**

Undertake dry sowing using either:

- (a) a tractor drawn seed drill to place seed at a depth of 5 mm; or
- (b) a spreader followed immediately by a single pass with an unweighted diamond harrow.

Where practicable, tractor passes with the seed drill or harrow must follow finished surface contours.

Distribute seed and fertiliser evenly over the areas to be sown at the rates specified in Annexure R178/A. Apply fertiliser concurrently with the seeding operation.

Gauge the application rate of the seed mix to ensure an even distribution over the areas sown, in accordance with the rates nominated in Annexure R178/A. Maintain records of measurements and calculations to determine actual distribution rates for each Lot.

### **3.4.3 Hydromulching and Hydroseeding**

Carry out hydromulching / hydroseeding within 2 days of completion of soil preparation or, if delayed by the weather conditions listed in Clause 3.4.5, as soon as weather conditions permit.

Agitate continuously the slurry to maintain a uniform consistency during application. Apply it uniformly over the whole surface at the rate specified in Table R178.1.

The sprayed hydromulch layer within 48 hours of application must have a minimum thickness at any location of 5 mm when using sugar cane mulch (mixed with shredded paper), or 2 mm when using wood fibre.

### **3.4.4 Straw Mulching**

The straw mulch must comply with the materials and application rates set out in Table R178.1.

Apply the straw mulch uniformly using a purpose-made blower unit. Incorporate the emulsion as a spray into the air stream of the mulch blower or apply it in a separate operation within 12 hours from the application of straw mulch.



The straw mulch layer must have a minimum thickness at any location of 25 mm within 48 hours of application.

### **3.4.5 Weather Conditions for Hydroseeding, Hydromulching and Straw Mulching**

Do not apply hydroseeding, hydromulching and straw mulching:

- (a) when winds exceed 15 km/hr;
- (b) when temperatures exceed 37°C,
- (c) where the surface is too wet; or
- (d) during rain periods or when rain appears imminent.

## **3.5 SIGNPOSTING**

Supply and install information signs approximately 1,500 mm x 600 mm stating "NATIVE PLANT REGENERATION AREA—PLEASE KEEP OFF", including the requisite posts, brackets and fittings, where shown on the Drawings or as directed by the Principal. Support each sign at a height of 1.5 m on two 75 mm diameter steel posts set in concrete 500 mm deep into the ground at a distance of 900 mm apart.

# **4 VEGETATION OF OPEN DRAINS**

## **4.1 PREPARATION OF SURFACE**

Treat weed infestation in accordance with Clause 3.1, but without using herbicides.

Where shown on the Drawings or directed by the Principal, apply the following protective treatment immediately to all or part of the surface to be vegetated.

### **4.1.1 Lining with Organic Fibre Mesh**

Lay the runs of the mesh along the direction of water flow.

Slot the upstream end of the mesh into a trench 150 mm wide by 150 mm deep and pin the mesh to the base of the trench at 200 mm centres. Backfill the trench with soil and compact by foot.

Lay the mesh taut and evenly over the soil surface without any air pockets but do not stretch it.

Overlap adjacent runs of mesh by 100 mm with the higher run lapped over the lower.

Pin the mesh along the sides of each run at 500 mm centres and along the middle of each run at 1 m centres.

End overlaps must be 150 mm wide with the higher run end lapped over the start of the lower and pinned at 200 mm centres.

## **4.2 SOWING**

Apply seed and fertiliser uniformly at the rates specified in Annexure R178/A by one of the following procedures, as shown on the Drawings or as directed by the Principal:

- (a) by hydroseeding or hydromulching (Clauses 3.3.2 and 3.4.3); or
- (b) by hand.

### **4.3 SPRAYING WITH BITUMEN EMULSION**

Spray a slow setting anionic bitumen emulsion over the sown surface at a rate of 1.0 litre of undiluted residual bitumen emulsion per square metre.

## **5 TURFING FOR SLOPES AND OPEN DRAIN AREAS**

Place turf on slopes and open drain areas where shown on the Drawings or where directed by the Principal.

Turfing for lawn areas as part of landscape planting must be in accordance with Specification TfNSW R179.

Keep the turf moist at all times during transport and site storage, and lay it in its final position as early as possible after delivery. Turf must be laid within 24 hours of delivery.

Prepare the surface areas to be turfed to the desired grades and levels. Surface levels (before turfing) for areas adjacent to kerbs must finish 35 mm below the top of kerb to allow for turf thickness.

Remove loose rock and any extraneous material from these areas.

For slopes with gradient 5 to 1 or flatter, lightly tyne the existing ground surface to a depth of 50 mm and then install 25 mm of topsoil to act as turf underlay. Rake the soil to provide an even surface for the turf.

Unroll the turf and lay them in parallel strips abutting at all ends and edges of the rolls. Spread additional topsoil to fill all joints and hollows, and where necessary, lightly roll the surface of the newly laid turf.

For open drains areas and slopes with gradients steeper than 5 to 1, tyning of the ground surface is not required. Butt runs of turf hard against each other and place the turf perpendicular to the direction of water flow. Pin turf into position at 500 mm centres.

## **6 TEMPORARY VEGETATION**

Vegetate stockpiles, stockpile sites and other areas nominated by the Principal to control erosion and weed invasion with the following cover crop species:

- (a) Rye Corn (during the months of April to August) at a rate of 35 kg per hectare;
- (b) Japanese Millet (during the months of September to March) at a rate of 35 kg per hectare.

Where directed by the Principal, include native seed in accordance with the species listed in Annexure R178/A.

## **7 AREAS DISTURBED BY THE CONTRACTOR**

Restore areas outside the limits of the Works which are disturbed by you (such as areas for compounds, material storage, access and haul roads) with vegetation in accordance with the requirements of this Specification.

## **8 MAINTENANCE**

Maintain all vegetated areas for 6 months after all sowing is complete or until Contract Completion, whichever occurs first.

Water areas where and when directed by the Principal. Water by means of a fine spray which causes minimal disturbance to seeded areas.

Water the turf immediately after laying until the underlay is moistened to its full depth. Continue watering every second day for the first 14 days, then, at regular intervals, maintain a discernible level of soil moisture until the turf is established. Do not allow turf to dry out during the establishment period.

Turf that is deemed to have died through your neglect, must be replaced and all associated costs for re-establishment of the turf will be at your own expense.

Clear dead vegetation from areas showing poor growth or damage and replace all lost topsoil. Then recultivate and reseed the area. The Principal may issue directions for other remedial work to be undertaken in conjunction with the recultivation and reseeded.

Control weeds as described in Clause 3.1.1.

Mow areas within 2 m of a road pavement when directed by the Principal. Cut the vegetation to a height of 50 mm unless otherwise directed.

**ANNEXURE R178/A – GRASS AND NATIVE SEED MIXES**

**NOTES TO TENDER DOCUMENTER:** (Delete this boxed text after completing Annexure R178/A)

Insert below the mix type designation and the area where it is to be applied, then complete the table below by providing details of the required grass seed and/or native seed types and their application rates.

Use separate sheets for different mix types.

Indicate in the right hand column whether pre-treatment to assist germination is required by inserting "Yes" against the appropriate species.

**Mix Type:** \_\_\_\_\_ **for Area:** \_\_\_\_\_

Species	Application Rate (kg/ha)	Pre-treatment <sup>(1)</sup> Required
<b>Grass Seed</b>		
<b>Grass Seed Sub-total</b>		
<b>Native Seed</b>		
<b>Native Seed Sub-total</b>		
<b>Organic Fertiliser:</b> Pelletised poultry manure		

**Notes:**

- (1) Pre-treatment consists of immersing the seeds contained in a bag in hot water at 90°C for 60 minutes.
- (2) All native seed will be supplied by the Principal. Only local native species will be used.
- (3) *Eucalyptus* seed must not be sown:
  - on embankments of sediment control basins;
  - within 10 metres of the edge of pavement where no safety barrier is to be provided, or within 4 metres of the edge of pavement where a safety barrier is to be erected;
  - within 10 metres of powerlines.
- (4) *Triticale* species must not be used in revegetation mixes in the Tablelands, Central Slopes and Western Plains regions, in order to prevent the spread of "wheat rust" in wheat growing areas.
- (5) *White, Strawberry and Subterranean Clovers* (used as cover crops) must not be used in conjunction with native seeding, since their aggressive spreading growth may prevent germination of native seeds.

- <sup>(6)</sup> All future mowing will be limited to a 2.0 m wide strip adjacent to both sides of the carriageway. The remaining road reserve areas must be left unmown to permit natural regeneration of native seed.

## **ANNEXURE R178/B – MEASUREMENT AND PAYMENT**

Payment will be made for all costs associated with completing the work detailed in this Specification in accordance with the following Pay Items.

Where no specific pay items are provided for a particular item of work, the costs associated with that item of work are deemed to be included in the rates and prices generally for the Work Under the Contract.

Unless specified otherwise, a lump sum price for any of these items will not be accepted.

The supply of the specified inert material to cover buried weed contaminated topsoil is allowed for in the rates for TfNSW R44. Measurement and payment for excavation of the contaminated topsoil and the excavation of the burial site is included in the pay item for general excavation in TfNSW R44.

Topsoil contaminated by your actions or omissions will not be measured. Measurement of topsoil imported to replace topsoil contaminated by your actions or omissions must be included under Pay Item R178P2 or R178P11, as appropriate, not R178P3 nor R178P12.

Work carried out in order to comply with Clause 7 is excluded from the measurements of all the Pay Items listed below; the cost is deemed to be included in the rates and prices generally for the Work Under the Contract.

Notwithstanding any general statements to the contrary that may be made elsewhere in this Specification, in the context of landscape works, all areas must be measured in the plane of the surface and thicknesses specified must apply perpendicular to the surface.

### **Pay Item R178P1 - Spraying Weeds with Herbicide**

The unit of measurement is the square metre of surface treated.

The length and width must be determined from the actual face area of completed work.

### **Pay Item R178P2 - Topsoiling Using Site Material Including Surface Preparation and Screening and Testing of Topsoil Stockpiles**

The unit of measurement is the square metre of surface of topsoiling.

The length and width must be determined from the face area of completed work.

Separate prices must be provided for different classes of work as follows:

**R178P2.1 Areas with a slope of 5 to 1 or flatter**

**R178P2.2 Areas steeper than 5 to 1 except stepped batters**

**R178P2.3 Stepped batters**

### **Pay Item R178P3 - Topsoiling Using Imported Material Including Surface Preparation**

The unit of measurement is the square metre of surface of topsoiling.

The length and width must be determined from the face area of completed work.

Payment includes surface preparation and supply and placing of imported topsoil.

Separate prices must be provided for different classes of work as follows:

**R178P3.1 – Areas with a slope of 5 to 1 or flatter**

**R178P3.2 – Areas steeper than 5 to 1 except stepped batters**

**R178P3.3 – Stepped batters**

**Pay Item R178P4 - Dry Sowing**

The unit of measurement is the square metre of surface treated.

The length and width must be determined from the face area of the completed work.

**Pay Item R178P5 - Hand Sowing**

The unit of measurement is the square metre of surface treated.

The length and width must be determined from the face area of the completed work.

**Pay Item R178P6 - Preparation of Surface for Areas Not Requiring Topsoiling**

The unit of measurement is the square metre of surface treated.

The length and width must be determined from the face area of completed work.

**Pay Item R178P7 - Hydroseeding**

The unit of measurement is the square metre of surface treated.

The length and width must be determined from the face area of completed work.

**Pay Item R178P8 - Hydromulching**

The unit of measurement is the square metre of surface treated.

The length and width must be determined from the face area of completed work.

**Pay Item R178P9 - Straw Mulching**

The unit of measurement is the square metre of surface treated.

Payment must include the costs of binder.

The length and width must be determined from the face area of completed work.

**Pay Item R178P10 - Supply and Erection of Information Signs**

The unit of measurement is per "each" sign erected.

The schedule rate must cover all costs associated with supply and delivery of the sign at the site including the requisite posts, brackets and fittings; excavation of the two holes; the concreting of the two 75 mm posts therein; and the attachment of the sign.

**Pay Item R178P11 - Topsoiling Open Drains Using Site Material Including Surface Preparation and Screening of Topsoil Stockpiles**

The unit of measurement is the square metre of surface of topsoiling.

The length and width will be determined from the actual face area of completed work.

**Pay Item R178P12 - Topsoiling Open Drains Using Imported Material Including Surface Preparation**

The unit of measurement is the square metre of surface of topsoiling.

The length and width must be determined from the face area of completed work.

**Pay Item R178P13 - Hydroseeding of Open Drains**

The unit of measurement is the square metre of surface treated.

The length and width must be determined for the face area of completed work.

**Pay Item R178P14 - Hydromulching of Open Drains**

The unit of measurement is the square metre of surface treated.

The length and width must be determined for the face area of completed work.

**Pay Item R178P15 - Sowing Open Drains by Hand**

The unit of measurement is the square metre.

The length and width must be determined from the face area of completed work.

**Pay Item R178P16 - Spray Open Drains with Bitumen Emulsion**

The unit of measurement is the square metre.

Measurement must only include those areas of open drains, where shown on the Drawings or directed by the Principal, to be protected by bitumen emulsion only.

The length and width must be determined from the face area of completed work.

**Pay Item R178P17 - Lining Open Drains with Organic Fibre Mesh**

The unit of measurement is the square metre.

Measurement must only include those areas of open drains, where shown on the Drawings or directed by the Principal, to be protected by bitumen emulsion and organic fibre mesh.

The length and width must be determined from the face area of completed work.

**Pay Item R178P18 - Turfing for Slopes and Open Drain Areas**

The unit of measurement is the square metre of turf laid and must include all items associated with installation of the turf and the initial watering.



The length and width must be determined from the face area of completed work.

Separate prices must be provided for different classes of work as follows:

**R178P18.1 – Areas with gradient 5 to 1 or flatter**

**R178P18.2 – Open drains and areas with gradient steeper than 5 to 1**

**Pay Item R178P19 - Watering (Provisional)**

The unit measurement is the kilolitre.

This work is to be carried out only upon the direction of the Principal.

The volume must be determined by calibrated dipstick readings or other approved method.

**Pay Item R178P20 - Recultivating and Resowing**

The unit of measurement is the square metre of surface treated. Areas recultivated and re-sowed as a result of actions or omissions by you must be at your cost and must not be included in the area measured.

The length and width must be determined from the face area of the completed work.

**Pay Item R178P21 - Mowing**

The unit of measurement is the linear metre of roadside strip mowed to a width of 2 metres.

## **ANNEXURE R178/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS AND IDENTIFIED RECORDS**

Refer to Clause 1.2.3.

### **C1 SCHEDULE OF HOLD POINTS AND WITNESS POINTS**

<b>Clause</b>	<b>Type</b>	<b>Description</b>
2.1.3	Hold	Delivery of imported topsoil
2.4	Witness	Application of fertiliser
3.3	Hold	Use of off site pre-treated seed
3.4.1	Witness	Sowing

### **C2 SCHEDULE OF IDENTIFIED RECORDS**

The records listed below are Identified Records for the purposes of TfNSW Q Annexure Q/E.

<b>Clause</b>	<b>Description of Identified Record</b>
2.1	Verification of compliance of imported topsoil
2.3	Name/s of proposed seed supplier/s

## ANNEXURE R178/D – REQUIRED NUMBER OF LOADS PER HECTARE FOR TYPICAL TANK CAPACITIES

The following tables give the approximate number of loads required per hectare of spraying, for typical tank capacities, in order to achieve the specified rates in Table R178.1 and the minimum thickness of the sprayed layer as specified in Clause 4.3.

### D1 Hydromulching

#### (a) Using Chopped Sugar Cane Mulch

Specified application rate of chopped sugar cane mulch: 3,500 kg/ha

Finished minimum dry depth of mulch material on ground within 48 hours of application: 5 mm

Tank Capacity	Loads per Hectare
5,625 litres	9
7,500 litres	8
10,000 litres	7
14,100 litres	5
14,400 litres	5
15,800 litres	5

#### (b) Using Wood Fibre

Specified application rate of wood fibre: 2,500 kg/ha.

Finished minimum dry depth of mulch material on ground within 48 hours of application: 2 mm.

Tank Capacity	Loads per Hectare
5,625 litres	8
7,500 litres	7
10,000 litres	5
14,100 litres	3.5
14,400 litres	3.3
15,800 litres	3

**D2 Hydroseeding**

<b>Tank Capacity</b>	<b>Loads per Hectare</b>
5,625 litres	5
7,500 litres	4
10,000 litres	3
14,100 litres	2
14,400 litres	2
15,800 litres	2

**D3 Strawmulching**

Finished minimum depth of mulch material on ground, with residual undiluted bitumen emulsion, within 48 hours of application: 20 mm

Approximate loads per hectare is as for hydroseeding.

## **ANNEXURES R178/E TO R178/L – (NOT USED)**

### **ANNEXURE R178/M – REFERENCED DOCUMENTS**

Refer to Clause 1.2.4.

#### **TfNSW Specifications**

TfNSW Q	Quality Management System
TfNSW R44	Earthworks
TfNSW R179	Landscape Planting
TfNSW 3254	Bitumen Emulsion

#### **TfNSW Test Methods**

TfNSW T109	Plastic Limit and Plasticity Index of Road Materials
TfNSW T119	Determination of Density of Road Materials in situ using the Sand Replacement Method
TfNSW T123	pH Value of Soil

#### **Australian Standards**

AS 1289 D1.1	Methods of testing soil for engineering purposes – Soil chemical tests – Determination of the organic matter content of a soil (Standard method)
AS 4419	Soils for landscaping and garden use